

upon a female gamete well stocked with food reserves, the stimulus of fertilization being similar to that induced in gall formation. The first sperm "vaccinates" the egg and renders it immune to other sperms. Many further analogies are drawn between sex and parasitism or symbiosis. More interesting is his distinction in higher forms between "sex" and "gender." Sex is purely sporophytic, determined in Mendelian manner by chromosome equipment; "male" signifies "microspore-producing," "female" signifies "megaspore-producing." "Gender" is gametophytic and is lodged in the cytoplasm; the nature of the cytoplasm may show gradations between the two extremes of "andropasmic" (or sperm-producing) and "gynoplasmic" (or egg-producing). Thus in a homosporous pteridophyte the spore is still diploid with reference to gender, which is differentiated later. Gradually the androplasm begins to dominate in some cells, gynoplasm in others, until at last the cells are sufficiently unlike to fuse again. Which kind dominates in a particular region may be tied up with nutrition. In heterosporous forms "the archesporial tissue of the anthers is predestined normally (chromosomes) to develop into microspores, an environment which favors the dominance of andropasmic protoplasm." To explain hermaphroditic spermatophytes the author states that "the production of anthers or ovaries is a sex or somatic (Mendelian) characteristic, which may show somatic segregation like other somatic characters." Carrying these ideas over to man, an effeminate man would be produced from an x zygote in which gynoplasm dominated, a masculine woman from a $2x$ zygote in which androplasm dominated. The author believes that many of the characteristics popularly associated with one sex only are in reality the common property of both sexes, although in one they may perhaps be limited in their expression.—MERLE C. COULTER.

Mineral absorption in spinach.—In attempting to demonstrate a causal relation between spinach blight and universal malnutrition, TRUE and his colleagues⁵ subjected spinach to very heavy applications of various fertilizers, both singly and in mixtures. As high as 1500 lbs. per acre of NaCl , NaNO_3 , and Na_2SO_4 , 6 tons of CaCO_3 , 2 tons of MgCO_3 , 2000 lbs. of acid phosphate, 4000 lbs. of complete fertilizer, and 40 tons of manure were used. Although failing to throw any light on the origin of the blight, the results contribute to our knowledge of mineral absorption by plants. The total ash, and each of its constituents with the exception of manganous oxide, was always greater in amount in the leaves than in the tops. The ash elements fall naturally into two groups: (1) those that are present in quantities that show relatively little variation whatever be the chemicals added to the soil (CaO , MgO , P_2O_5 , SO_3 , MnO , Al_2O_3 , and Fe_2O_3); and (2) those which show great fluctuations in the quantity present (SiO_2 , K_2O , and Na_2O). The elements of the first group

⁵ TRUE, R. H., BLACK, O. F., and KELLY, J. W., Ash absorption by spinach from concentrated soil solutions. Jour. Agric. Res. 16:15-25. 1919.

were evidently absorbed in the required quantities irrespective of what was offered in excess. Those of the second group varied widely, sometimes with an increase of the ion offered in excess, as in the case of Na_2O , and sometimes with an increase of some other element, as in the case of SiO_2 in the plots receiving CaCO_3 and acid phosphate. The soda-potash ratio was subject to extreme variation, but was always greater than 1 in both tops and roots. There were indications that sodium may partly replace potassium in function in spinach, since the percentages of the two usually varied in the reverse order. The writers suggest that NaCl as a fertilizer for other crops might serve as a potash sparer. There was always more magnesia than lime present, except in the plots receiving a heavy treatment of CaCO_3 , which suggests the possible practical value of magnesium salts as fertilizers for spinach.—J. J. WILLAMAN.

Permeability.—A new working hypothesis as to the nature of permeability and changes in permeability of protoplasm, which seems to the reviewer less objectionable than any yet proposed, is offered by FREE.⁶ Protoplasm is considered as a colloidal system of at least two phases, differing from one another mainly in the proportion of water each contains, and arranged as colloidal globules in a colloidal medium. These phases are supposed to exhibit interchange of water, so that globules may decrease in size by giving up water to the medium, which gains in size; or, vice versa, globules may increase in size by receiving water from the medium, which thus becomes thinner and thinner as the globules enlarge.

The medium is considered the important phase from the standpoint of permeability changes, as it is continuous. Anything that can dissolve in the medium should be able to penetrate. Water undoubtedly penetrates both phases. Anything which tends to increase the size of the globules at the expense of the medium is conceived to decrease the permeability of the protoplasm; conversely, things tending to decrease the globules are conceived to increase its permeability. Semipermeability is related to a very thin medium between the globules. Any reagent increasing thickness of the medium at the expense of the globules should decrease semipermeability if this conception is correct. Antagonism would be explained by the effect of the antagonistic element or ion on the globules, enlarging them so that the medium is too thin to permit entry of the toxic element. As a working hypothesis it has some advantages over any other hypothesis which has been proposed. It should stimulate research designed to test its merits, for definite testing seems quite possible.—C. A. SHULL.

Self-sterility.—EAST and PARK have already demonstrated⁷ that self-sterility in tobacco is heritable, and that cross-sterility depends upon likeness

⁶ FREE, E. E., A colloidal hypothesis of protoplasmic permeability. *Plant World* 21:141-150. 1918.

⁷ BOT. GAZ. 66:461-462. 1918.